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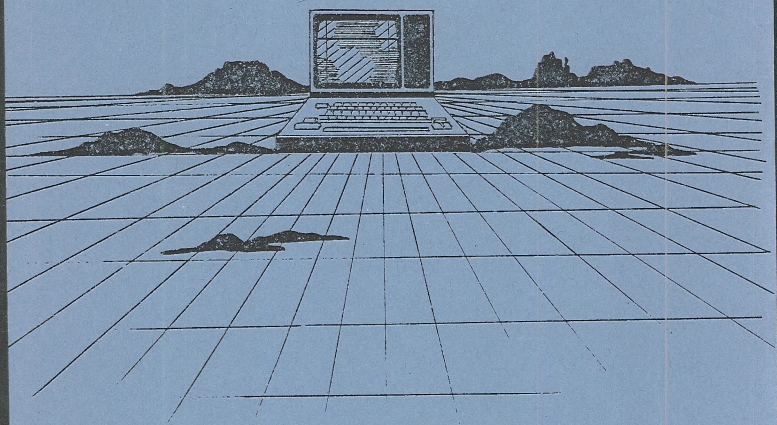

Second National MOSS Users Workshop

January 21-25, 1985 Denver, Colorado

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PROCEEDINGS OF THE 1985 NATIONAL MOSS USERS WORKSHOP

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July 1985

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
AGENDA	3
USERS WORKGROUP SUMMATION	5
A. Introduction	5
B. Goal	5
C. Objectives	5
Objective 1 - Update the List of Known MOSS Problems	5
Objective 2 - Update the List of Needed MOSS Enhancements	7
Objective 3 - Identify the Needs and Issues that Need to be Addressed by Management and Systems Personnel	9
Objective 4 - Develop Better Communications Within the MOSS User Community	11
Objective 5 - Establish Guidelines for the 1986 National MOSS Users Workshop	12
D. Summary	13
SYSTEM WORKGROUP SUMMATION	
A. Goals	15
B. Configuration Issues	15
1. Maintenance of Compatibility	15
2. Versions of MOSS	16
3. Subsystems of MOSS	16
4. Hardware	17
5. File and Space Management	18
C. Coordination	19
D. Management Summary	19
MANAGEMENT WORKGROUP SUMMATION	21
A. Goals	21
B. Agenda	21
C. Department of the Interior (DOI) Procurement	21

Page

D. Cooperative Strategy for Technology Transfer (See Appendix D) 22

1. Membership/New Membership Procedure 22
2. Five-year Development Plan 23
3. Joint Funding Strategy 24
4. MOSS "Common" Version Definition/Maintenance 24
5. Agency Role Definition 25
6. Other 25

APPENDIX A - List of Workshop Participants

APPENDIX B - Abstracts for User Presentations

APPENDIX C - Cooperative Strategy for Technology Transfer

APPENDIX D - MOSS Problems Identified in 1984 and 1985 as Needed Fixes and Status of All Fixes to Software Problems

APPENDIX E - MOSS Enhancements Identified in 1984 and Status of Enhancements as of June 1985

INTRODUCTION

The Second National Map Overlay and Statistical System (MOSS) Users Workshop, hosted by the Denver Service Center, was held in Denver, Colorado, on January 21-25, 1985. The objectives of the workshop were to (1) continue interagency communication among the user community regarding MOSS applications and development, (2) discuss changes implemented during the last year and identify research and development needs for MOSS, and (3) continue coordination of future MOSS software maintenance and development.

The second workshop was much larger than the first (151 attendees compared to about 60) because of a significant increase in the number of users and new applications of MOSS. There was excellent representation from U.S. Government agencies including, the Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), Soil Conservation Service (SCS), U.S. Geological Survey (USGS), Bureau of Indian Affairs (BIA), U.S. Forest Service (USFS), and the U.S. Army Corps of Engineers (USACE). In general, there were representatives from headquarters as well as the field offices. Also represented were universities, state governments and private companies. BLM, FWS and USFS also held meetings after the conclusion of the main workshop. (Appendix A lists participants.)

The afternoon session of the first day focused on status reports for Geographic Information System (GIS) implementation by agency. A total of seven agencies provided information about ongoing as well as planned GIS activities. Selected individuals from these agencies gave presentations that covered each agency's planned use of GIS, status of implementing GIS, status of ongoing activities and applications, and policies. Agencies and individuals represented in this session included Denny Parker (BLM), Claude Christensen (USFWS), Bob Wright (BIA), Terry Gossard (USFS), Eric Anderson (USGS), Liz Porter (USACE/ETL), and Tim Sweeney (SCS). Additional reports were provided on the Interior procurement and IDCCC activities by Charles Gish (USFWS) and Eric Anderson (USGS), respectively, during the morning of the second day. The rest of the second day was devoted to presentations and discussions of MOSS-related applications. A total of 17 papers were presented representing applications in six Federal agencies, two state agencies, one university, and one private organization. Abstracts for the presentations are provided in Appendix B.

The final session spanning 1-1/2 days consisted of three separate subgroup work sessions held for managers, users, and systems personnel. An especially noteworthy outcome of the managers session was the inclusion of the USGS National Mapping Division as a participant in the Cooperative Strategy for Technology Transfer (see Appendix C). Hopefully, more government agencies will ultimately become members of the cooperative strategy.

AGENDA

Monday, January 21st

SPEER/MOFFAT ROOM

11:00-1:00 Registration (Pat Parlin-TGS, Larry Bagwell-TGS)
1:00-1:15 Welcome (Denny Parker-BLM)
1:15-1:30 Workshop Objectives (Ralph Marker-BLM)
1:30-1:45 Intro/Logistics (Ralph Marker-BLM)
1:45-2:15 MOSS Users Status Report (Duane Asherin-USFWS)
2:15-2:30 Break
2:30-4:15 Individual Agency Reports
BLM-Denny Parker
USFWS-Charles Gish
BIA-Bob Wright
USFS-Terry Gossard
USGS-Eric Anderson
USACE/ETL-Liz Porter
SCS-Tim Sweeney
5:00-7:00 Attitude Adjustment

Tuesday, January 22nd

SPEER/MOFFAT ROOM

8:00- 8:15 Report on Interior Computer Procurement (Charles Gish-USFWS)
8:15- 8:30 Report on IDCCC Activities (John McLaurin-USGS)
8:30- 9:50 MOSS User Presentations (field uses and applications)
Bruce Keating: BLM "Implementation of GIS in Wyoming"
Bob Wright-BIA: "MOSS Applications and Status in the Portland Area Office, Bureau of Indian Affairs"
Dave Anderson-SCS: "SCS MOSS Evaluation in Larimer Co., Colorado"
Robert Bailey/Scott Smith-State of Oregon: "The Oregon State GIS Experience"
9:50-10:00 Break
10:10-11:30 MOSS User Presentations
Jay Stephan-USFS: "MOSS and Forest Planning"
George Long-BLM: "Piceance Basin RMP and Follow-up Applications"
Jim Henderson-USFWS: "Use of AMS/MOSS in Alaska's Refuge Planning Process"
Mike Marxen, Deb Southworth, and Sam Williamson-USFWS: "Planning and Management for Wildlife Habitat on Big Stone National Wildlife Refuge"
11:30- 1:00 Lunch
1:00- 3:00 MOSS User Presentations
Paul Currier-Platte River Trust: "Platte River Crane Habitat Management"
Ross Pywell-USFWS: "Office of Migratory Bird Management: Air-Ground Habitat Transect Analysis"
Gail March-State of Alaska: "Geochemical Data Analysis for Mineral Resource Assessment Using MOSS"
Butch Smith-BLM: "Visual Assessment of Mine Waste Disposal"
Mike Hardaway-USACE/ETL: "Terrain Analysis"

3:00- 3:15 Break
3:15- 5:00 MOSS User Presentations
Page Spencer-BLM: "MOSS Application to Cadastral Survey Meander Line Data"
Page Spencer-BLM: "Resource Geoprocessing"
Bill White-USFS: "Integrated Pest Impact Assessment System Update"
Bruce Morse-Univ. of Minn.: "Forest Pest Management on the Nicolet National Forest Using the Microcomputer Version of MOSS"
Jeff Nighbert-BLM: "User Management Concerns"
5:30- 7:30 Attitude Adjustment

Wednesday, January 23rd

SPEER/MOFFAT ROOM

8:00- 8:30 Software/Systems Report (Eric Strand-BLM)
8:30- 9:00 Feasibility and Design Study for Enhancements to MOSS (Lyn Oleson-USGS)
9:00- 9:15 Subgroup Assignments (Ralph Marker-BLM) Rooms AB, DE, F
9:15- 9:30 Break
9:30-11:30 Subgroup Work Sessions
11:30- 1:00 Lunch
1:00- 3:00 Subgroup Work Sessions
3:00- 3:15 Break
3:15- 5:00 Subgroup Work Sessions
Subgroups-USERS-Chairperson . . . . . Bob Ader, BLM
Facilitator . . . . . Daniel Webster, TGS
Recorder . . . . . Angel Parker, TGS
-SYST-Chairperson . . . . . Eric Strand, BLM
Facilitator . . . . . Gregg Johnson, TGS
Recorder . . . . . Steve Russell, TGS
-MGMT-Chairperson . . . . . Duane Asherin, USFWS
Facilitator . . . . . Dick Fisher, USFWS
Recorder . . . . . Barb White, USFWS

Thursday, January 24th

ROOM DEF

8:00- 9:30 Subgroup Reports
9:30- 9:45 Break
9:45-11:00 Subgroup Reports
11:00-11:30 Workshop Summary

Individual Agency Workshops

BLM-ROOM AB

Thursday, January 24th 1:00- 5:00
Friday, January 25th 8:00-12:00

USERS WORKGROUP SUMMATION

A. Introduction

The users subgroup was the largest of the three subgroups; it consisted of 54 individuals, most of whom were relatively new MOSS users. Many of last year's attendees had moved to the management or systems subgroup. However, a core of experienced individuals was carried over from the previous workshop. Only 10 individuals were advanced MOSS users, functionally defined as users who could perform all tasks required in MOSS to complete a GIS project. Participants thus ranged from those with no hands-on experience to those considered advanced users.

B. Goal

The goal of the users subgroup work session was to provide a forum for the exchange of information and to serve as a collective voice to express the needs, concerns, issues, and recommendations of the MOSS user community.

C. Objectives

Objectives of the users subgroup were discussed at length and 23 objectives were identified. These objectives were consolidated and assigned a relative priority of high, medium, or low based on subgroup votes. The subgroup realized that all objectives could not be addressed and as a result selected the 5 objectives with the highest priority. These objectives served as the basis for discussion in the subgroup work session and are listed below:

Objective 1 - Update the list of known MOSS problems.

Objective 2 - Update the list of needed MOSS enhancements.

Objective 3 - Identify the needs and issues of the user community that need to be addressed by management and systems personnel.

Objective 4 - Develop better communications within the MOSS user community.

Objective 5 - Establish guidelines for the 1986 MOSS Users Workshop.

It should be noted that objectives 1 through 4 were also among the highest priority objectives established and discussed at the previous MOSS Users Workshop.

Objective 1 - Update the List of Known MOSS Problems

Updating the list of known problems was given the highest priority for discussion. It was also identified as last year's highest priority objective. Thus the major objective was to discuss known problems and to share experiences with problems that have been encountered so that solutions "work arounds" could be identified.

MOSS problems were defined as those functions in the system that need to be fixed. Many times the documentation incorrectly references the capabilities or limitations of a function. These situations were discussed and recommendations were made to fix the software or correct the documentation.

Most of the problems identified this year were also identified and discussed at the previous workshop, indicating that only a few new problems had been encountered over the past 18 months. The new problems were related primarily to the display commands in MOSS such as TEXT and CALCOMP; few additional problems were identified for analytical commands. A secondary area in which problems were identified resulted from the integration of the FWS and BLM versions of MOSS. This integration was not entirely completed and, as a result, many users asked for capabilities to be added or fixed.

It should be noted that much progress has been made in fixing problems and installing enhancements that were identified at the previous workshop. After the first workshop, a select group of users reviewed the progress of fixes and enhancements and clarified any documentation problems. This September 1983 meeting consisted of users and systems personnel from a number of agencies. This documentation was used as the major input to the MOSS Systems Follow-up meeting held in May of 1984 at Colorado State University. The record of this session is available from the U.S. Fish and Wildlife Service, Western Energy and Land Use Team, in Fort Collins, Colorado.

Please note that all MOSS installations do not have the same version or revision of MOSS and that some of these commands have already been fixed. Different revisions at various installations can make the identification and documentation of problems a difficult task. See Appendix D for the definitions of this year's MOSS command problems and problems remaining from the 1983 workshop as well as a list of fixes that have been made. Below is a list of the MOSS commands and issues identified as having a problem that have been encountered since the last workshop.

List of commands with problems and issues identified in 1984-85:

- ASSIGN
- CALCOMP
- DELETE
- FLOOD
- FREE
- GENERATE
- POLYCELL & RASTERIZE
- LOCATE
- PROJECTION
- RENAME (maps)
- SELECT
- TEXT
- FUNCTION (maps)
- UTILITY - DATABTEST - RENAME
- UTILITY - DLG TO MOSS
- UTILITY - LEGEND

- Variable array size limitations for cell maps
- Inconsistency of prompts
- Conversion of old work files to the MOSS/MAPS data format

*See Appendix D for detailed descriptions.

Objective 2 - Update the List of MOSS Enhancements

The second highest priority of the users was to update the list of desired GIS enhancements. It should be noted that these lists include enhancements for Automated Digitizing System (ADS), Analytical Mapping System (AMS), Cartographic Output System (COS), and MOSS. This was also the second highest priority item for discussion at the first MOSS workshop, indicating that the users want the capabilities needed to make their work easier and faster.

Many of the enhancements identified were also discussed at the previous workshop. Users remained firm about demanding an ARC/NODE data analysis structure and a relational data base management system (RDBMS). However, many new enhancements were also discussed.

The new MOSS enhancements are listed below. See Appendix E for a complete list of the enhancements identified in 1984 and a list of implemented enhancements.

1. SELECT - Provide the capability to select character strings from specified columns in the subject listing.

2. Allow the user to process information that transcends more than one UTM zone. This capability currently exists but is cumbersome and not well documented.

3. Ensure that all work files created in MOSS should contain an associated history file that provides a summary of how the map was created.

4. Carry over text line and symbol information generated with the TEXT, ASSIGN, LINE, ANNOTATE, and SYMBOL commands to plot files in CALCOMP and COS.

5. Examine directory structures and develop a strategy to accommodate multiple users in the same project area.

6. Standardize the format of prompts to eliminate possible confusion and increase user efficiency.

7. Enhance the capability to plot rasterized data on multiple plotters.

8. ADD - Improve documentation to clarify the relationship between the minimum bounding rectangle (MBR) of a map and the scale factor.

9. Install the capability to resample cell data with methods such as nearest neighbor analysis, bilinear analysis, and cubic convolution. This would allow users to change the acreage and dimensions of rasterized data.

10. Install better data exchange capabilities between MOSS and other GIS systems. This effort should expand the number of systems for exchanging data and allow maps imported from other systems such as IDIMS to retain their original values, or assign values according to a translation file.

11. Expand ten-character limitations for a map name to 30 characters.

12. Establish a library of macros that contains listings and definitions.

13. Integrate the capability of commands to process data regardless of data type. Data types should be transparent to the user and to the MOSS commands. If a command cannot be performed on a map because of data type, the user should receive an explanation and given the option to convert data to the appropriate format. For example, the OVERLAY command should work with vector or cell data, thus eliminating the requirement for four other commands performing overlay on different data types.

14. Add a template capability for ARCHIVE and DEARCHIVE commands (XX+, +XX, +XX+).

15. QUERY - Implement the capability to inquire about multiple items.

16. REPORT - Install the ability to print more than six fields in the hardcopy output.

17. Install more smoothings algorithms in the GRID and CONTOUR commands.

18. Implement a checkpoint that does not allow a user to log back into MOSS after using the CLI command to transfer to the AOS environment.

19. ACTIVE - Enhance this to run faster.

20. GENERATE - Improve to allow editing capabilities and less text for data creation.

21. Allow 3-D plots to be transferred to the MOSS CALCOMP command and COS.

22. Install the capability to create pie charts, graphs, and multiple bar charts in MOSS/COS.

23. Install the capability to generate cross-sections and fence diagrams.

24. QUERY - Enhance to allow reporting on attributes in an associated relational data base.

25. Set COS line and symbol tables to those of real BLM standards.

26. FLOOD - Modify so it can work from a point in polygon routine. This could be implemented in ADS/AMS and carried over to MOSS.

27. SAMPLE - Enhance to handle any size map. The limitation in SAMPLE is currently 100 items.

28. Resolve island matching problems in AMS.

29. GRID - Install the ability to accommodate barriers.

30. Install a point distribution analysis. Users recommended nearest neighbor analysis.

31. Research and implement a network analysis capability.

32. Allow for better use of raster refresh capabilities for map analysis and display.

33. Install interactive map component positioning in COS.

34. Enhance the system to generate a polygon from an identified point using dimensional and directional criteria.

35. GENERATE - Allow for the accommodation of latitude/longitude as well as UTM coordinates.

36. Enhance the system so that the user can create a relative distance map based on multiple themes of mapped information such as slope. This capability should be implemented so that the user can create a continuous surface or a zoned map. This capability should also accommodate barriers.

37. Install the capability to compute and total volumes in MOSS and MAPS (cell data and vector data).

38. Install the capability of modeling land fill scenarios on a DEM or equivalent continuous surface map.

Objective 3 - Identify the Needs and Issues that Need to be Addressed by Management and Systems Personnel

The third priority issue was to list the user needs, issues, and recommendations that require action for the managers or systems subgroup. These issues will be submitted to the newly formed Steering Committee for response. Figure 1 shows the conceptual flow of information within the MOSS community. The list is summarized below.

1. Implement the fixes and enhancements to MOSS that were identified in the 1984 and 1985 MOSS Users Workshops.

2. Develop a list of contacts that can be used to provide interagency technical assistance and support. This list was felt to be especially critical to installations that have inexperienced personnel or those that are establishing an operational system.

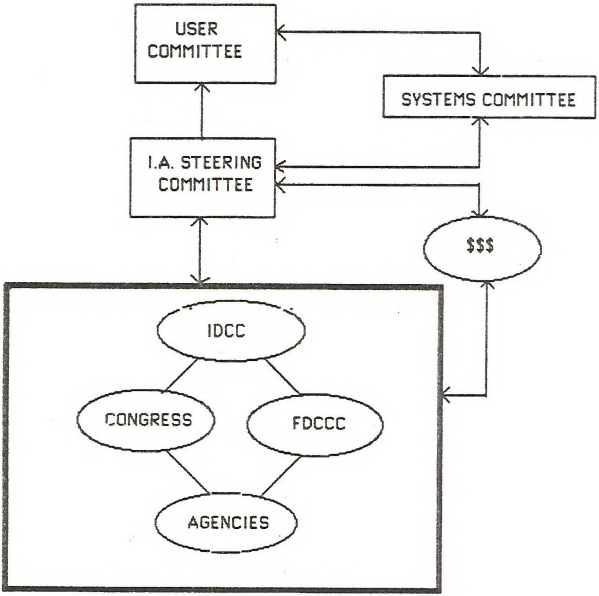

Figure 1. Flow of information within the MOSS community.

3. Establish a formal testing procedure for new releases and standardize releases to all installations currently using MOSS and its family of subsystems such as COS, ADS, and AMS. The group agreed that new releases should be installed every six months, with the option of installing patches in critical situations.

4. Scope and document MOSS systems management problems, i.e., disk space, CPU usage, I/O, and organization. The group agreed that many installations need systems management training as it relates to MOSS users and multiple-project environments.

5. Establish some medium of communication so the users can keep abreast of other applications, solutions to problems, and advancing technology. This could be in the form of a bulletin board, a consolidated written document, or a combination of these two.

6. Compile a MOSS project summary library that could be accessed remotely. Users confirmed that some effort should be made to summarize applications, command flow charts, and methodologies.

7. Define agency roles for improving and/or enhancing MOSS software. This should prevent the duplication of effort and allow agencies to better plan future developments and funding allocations.

8. Develop a separate funding initiative for future software and systems development, support, maintenance, and enhancement. This initiative should be submitted to Congress for approval and implementation.

9. Include the other subsystems that are currently used with MOSS in future developments and planning efforts.

10. Establish a user advisory committee that has direct access to the GIS Steering Committee. This would be essential to maintain a user driven system and would ensure that the Steering Committee has the most up-to-date information from which to draw upon for decision making.

11. Continue to hold the National MOSS Users Workshop on an annual basis.

Objective 4 - Better Communications within the MOSS User Community

The fourth objective was to discuss strategies and mediums to improve communications (1) among users and (2) between systems and management personnel and users. Many mediums were discussed; a regularly scheduled report was chosen as being the best solution. The report should focus on project reports and serve as a problem reporting mechanism. Personal networks of contacts were cited as being very important, so the group encouraged all users to establish informal communication networks.

The second form of communication discussed was referred to the documentation that should accompany new releases of the software. Users were concerned that the news and help files are not always up to date and may not be adequate.

These files should be created with user input and reviewed by a user representative before the revision is released. Many commands and capabilities currently have no documentation. These undocumented items need to be incorporated into the help files.

Although other means of communications were mentioned, the two discussed in the above paragraphs had the most support among users.

Objective 5 - Establish Guidelines for the 1986 National MOSS Users Conference

The final objective addressed was recommendations for the next workshop. The users felt that it was very important to establish guidelines for the 1986 workshop as early as possible. Toward this end, the users listed changes that should be implemented at the next workshop. The recommendations are listed below.

1. Papers should be accepted from any MOSS user. Previously, papers had to represent a government agency's application, with most emphasis placed on federal applications. The users agreed that all users should be given the opportunity to make a presentation about their application(s).

2. Vendors should be permitted but not recruited to participate in the 1986 workshop. Users wanted to see more alternatives for software integration and hardware implementation. As long as vendors show potential for assisting the MOSS user community, they should be allowed to participate at their own expense.

3. Poster sessions should be incorporated to provide an opportunity to show output products and to demonstrate the output and/or graphics capabilities available with the systems.

4. A small registration fee should be changed to cover materials (for example, notebooks) and to strengthen commitments for attendance at the workshop.

5. The other subsystems--AMS, ADS, and COS--should be included to establish stronger links and/or communications between these systems and their users. This would require a significant expansion of the workshop's format and reorganization.

6. More emphasis should be placed in papers on the specific use of the systems (i.e., MOSS commands and flow chart diagram). Users agreed that papers should be screened for their content and allowed only if the use of the systems is included. The main emphasis of papers should be on how MOSS was used to solve a problem.

7. The presentations should be divided into categories representing the subgroups and given in three separate sessions: management, systems, and applications.

D. Summary

The users subgroup was not able to discuss all of the objectives identified at the outset of the workshop; however, the highest priority items were covered. Because of time constraints, many desired enhancements had to be documented by individuals and forwarded to the chairman for inclusion in the report. The recommendations of this subgroup should be considered seriously in decisions concerning future software development, upgrades, and implementation because they come from the individuals that must actually use the system.

SYSTEM WORKGROUP SUMMATION

A. Goals

Goal 1 - Discuss configuration issues and make recommendations.

Goal 2 - Develop and coordinate long-term and short-term system and software development and maintenance strategies.

Goal 3 - Establish a timeframe for system implementation.

NOTE: Goals 2 and 3 were largely included within the context of Goal 1. The result is one outline that includes configuration and coordination issues, and implementation priority within each category specified in months beginning February 1, 1985.

B. Configuration Issues

1. Maintenance of Compatibility

a. Describe existing operating systems that support MOSS, including VAX, HP, Data General, etc. A survey of where we are in moving MOSS to operating systems other than Data General was requested. This was seen as an integral part of the compatibility question. (3 months)

b. Define the baseline configuration of MOSS within various operating systems, with priority to Data General. The concept is to have a standard configuration tape for each operating system to ease the problems of integrating an operating system with MOSs. This will be a time saver with multiple installations. (6 months for Data General).

c. Investigate the development of a MOSSGEN tape that keys off the system configuration. This would allow an installation to dump the operating system and then MOSSGEN and be completely operational, eliminating the tedious task of knitting everything together. MOSSGEN may include link files, operating system commands, etc. (9 months)

d. Review the ELAS software distribution process. The ELAS software distribution process was noted as being very efficient with wide coverage. It was suggested that the ELAS system serve as a model for MOSS and other public domain software distribution systems. (9 months)

e. Define baseline versions of sysgens for operating systems for each MOSS host. This would mean expanding recommendation #3 to include operating systems. (24 months/2nd quarter 1984)

f. Maintain separate versions of MOSS and sysgens for 32-bit, 16-bit, and virtual memory systems. This is not meant to restrict MOSS capabilities to the lowest common denominator; documented variations will still be allowed within each group. This will encourage more standardization of the less esoteric functions of MOSS. (FY 87)

g. Develop a central distribution center for software. Location and process may be agency-centered or other as options arise. This is designed to ensure all software updates and documentation are distributed thoroughly and quickly. This distribution method may be based on the process described in item d above. (FY 87)

2. Versions of MOSS

a. Adopt a policy of striving toward a unified MOSS by 1989. Although a "one MOSS" is neither desirable nor achievable, a major portion of the software should be standardized across the many installations. Even though new applications and software routines are encouraged, an effort at directing, documenting, and distributing enhancements is needed. (1989)

b. Define a baseline version of MOSS. There were 17 different names for MOSS at the second Annual Users Workshop. It was felt there should be one standard version of MOSS that all alterations and enhancements would be gauged against and that would be the same at each installation. This need not encompass the entire software; only certain main modules of the program would be affected. (1 month)

c. Maintain a record of system deviations from the baseline MOSS. This would allow users to see what other users are doing to get the most out of the software. This will also create a pool of "add-ons" or options to choose from. (2 months +)

d. Produce a short document describing different MOSS versions. This would be the method of describing the baseline that exists and the agency-specific deviations from that baseline. (9 months)

3. Subsystems of MOSS

a. Improve the development and maintenance support for data entry subsystems. The documentation, development, and support of data entry subsystems was deemed inadequate. More training and better documentation are very important. Technical support of specific subsystems (AMS, ADS, etc.) has become more important as more installations have in-house data entry operations. (1 month)

b. Address the use of the USGS Digital Line Graph or Defense Department Standard Linear Format. A standard digital map needs to be defined. If a single format is used consistently, compatibility between different systems would be enhanced. (3 months)

c. Develop training for individual operating systems at MOSS sites. Training may duplicate support services offered by the operating system vendor. (6 months)

d. Address the development of a generic reformatting program for inclusion in MOSS. A command within MOSS that reformats any input file into MOSS format would be useful. (6 months)

e. Expand the arc/node design study to include capabilities of subsystems. The USGS design study should be extended to include studies of the input and output subsystems (AMS, COS, MAPS, etc.). (9 months)

f. Develop a characteristics matrix for each subsystem. Such a matrix would allow selections from the "subsystem menu" that best fit the requirements of a needs assessment (AMS, ADS, MAPS, COS, Projections). (9 months)

g. Make small volume digitizing capability available to remote users. The difficulty of running two communications lines (terminal and tablet) over one communications link needs to be addressed. (12-18 months)

h. Establish training sessions for subsystems. The many so-called subsystems of MOSS also have become very large and sophisticated. As operators become more specialized in plotting, digitizing or analysis, training sessions on specific subsystems is warranted. (FY 86)

i. Develop an interface to existing DBM subsystems. The need for more sophisticated data base management functions has become apparent. These types of subsystems operate independently from MOSS but allow easy communications between the two systems. (FY 86)

j. Develop public domain DBMS for MOSS. The value of public domain software for bringing out the creativity of users is noted. Applying user-driven development pressure (vs. market pressure) to a data base management system is seen as desirable, as is the significant increase in number of users that may obtain the low-cost or no-cost software. (FY 90)

4. Hardware

a. Isolate machine dependencies (word size) and operating system dependencies (virtual memory).

b. Provide training on operating systems. Training on generating MOSS-specific operating systems is desirable. A much noted problem of MOSS users is file and space management; operating system training may help to alleviate these problems. (6 months)

c. Ensure the completion of the FWS-BLM procurement contract award. The results of a successful procurement will be felt further than the new installations themselves. This action will help ensure the survival and spread of GIS technology at many different levels of resource management, both government and private. We often find ourselves in uncertain funding situations. This goal must be attained as soon as possible. (6 months)

d. Implement ANSI FORTRAN 77. The move to an ANSI standard language will improve the "portability" of MOSS to different systems. (24 months/FY 87)

e. Develop machine independence for MOSS peripherals. Many users can testify to the problem of the host-peripheral interface. Much time could be saved with device-independent software, coupled with operating system training. (FY 87)

5. File and Space Management

a. Investigate advanced data technology and storage, e.g., data compression techniques and optical digital disks. Since we have begun to use the word gigabyte so frequently in our description of data bases, it is necessary to address efficient, affordable gigabyte data storage. Optical disk technology has been applied to audio and visual digital recordings with a high degree of technical success. Master data bases could be stored on optical disk and provide benefits analogous to microfiche use in libraries. The development of a read/write optical disk would revolutionize data storage. (6 months)

b. Establish and publish file management guidelines. Information concerning file management, backup procedures, reformatting, etc., needs to be distributed to users. Special attention to space considerations is requested. (6 months)

c. Investigate single data base structure. A single data base structure used across all types of public domain systems would enhance data compatibility. (9 months)

d. Develop a flexible archiving/restoring algorithm. The importance of archiving in space management leads to the need for possibly a one-
or two-command procedure for storing dependent operator-independent archiving was proposed, in which a file left inactive for a certain period of time was archived automatically. Some requested a time interval of five minutes before archiving. (12 months)

e. Enhance data file indexing. A method of searching for data other than listing map names was requested. Projects containing 80 quad maps and 50 workfile maps can be tiresome to list. (12 months)

f. Implement system changes to make data storage more efficient. The systems subgroup felt that the resolution of file and space management problems should occur by FY 87 at the latest. (FY 87)

g. Apply RDBMS to file management systems, including graphics plot files. There is a demand for a relational data base manager that is linked to the plot files. Editing from either a digitizing tablet or a terminal would be reflected automatically in associated data bases. (FY 87)

C. Coordination

1. The Management Steering Committee needs to address:

   - Creation of a central information center. (3 months)
   - Sites to distribute publications and software. (4 months)

2. The System Subgroup will review the results of their work before giving them to the Management Steering Committee. (2 months)

3. A Technical Work Group needs to be established and should meet quarterly. (4 months)

4. The Management Steering Committee will decide who will be in the Technical Work Group. (3 months)

5. User agencies should be polled for MOSS development plans as a guide for further development. (5 months)

6. Significant developments of or enhancements to MOSS should be frozen until after the Design Study is complete and the Management Steering Committee has reviewed the results. (6 months)

7. A quarterly MOSS bulletin/newsletter/memo/flyer/paper, etc., should be created to publish tips, new applications, and solutions to problems. (6 months)

8. A central information center should be created for MOSS and subsystems. (FY 87)

D. Management Summary

The following are recommendations from the Systems Subgroup to the Management Subgroup for near-term action:

1. Establish the information center to collect information for distribution.

2. Establish a distribution center to distribute publications and software.

3. Establish a Technical Work Group with representation from each concerned agency to support the Management Steering Committee.

4. Address the use of Digital Line Graph or Standard Linear Format as a common data format. This action requires coordination with the IDCCC and other groups.

5. Ensure that the FWS-BLM contract award is completed in FY 85, with procurement continuing through FY 91.

MANAGEMENT WORKGROUP SUMMATION

A. Goals

The Workgroup's goals are threefold:

Goal 1 - To gain an understanding of the agenda items regarding status/issues/problems.

Goal 2 - To develop work assignments and schedules for the agenda items.

Goal 3 - To assist in facilitating accomplishment of the work assignments following the workshop.

B. Agenda

Interior Computer Procurement - FWS/BLM Commitment - Software Conversion - Acceptance Testing - Training Needs (Hardware and Software)	10:15 - 11:00
Cooperative Strategy - Membership/New Membership Procedure - Five-Year Development Plan - Joint Funding Strategy - MOSS "Common" Version Definition/Maintenance - Agency Roles	11:00 - 4:30
Other	
Summary/Workgroup Presentation	4:30 - 5:00

C. Department of the Interior (DOI) Procurement

The ongoing DOI computer procurement was the first subject discussed by the Management Workgroup because of its importance and relevance to the other agenda items, such as the five-year development plan and the definition/maintenance of a "common" MOSS version.

General specifications of the procurement include:

- 32-bit or larger machines
- four classes of machines: A through D
  - CPU, disk drive, tape drive, printers, and terminals included
  - No GIS peripherals (e.g., digitizing tablets, plotters, etc.)
- five-year procurement life
- about 300 systems
  - FWS currently committed to purchasing three systems in FY 85
  - BLM planning to purchase three systems in FY 85
- software conversion includes (W)AMS, ADS, MOSS, and COS

Currently, the FWS and BLM are the only Interior agencies participating in the procurement. The procurement includes hardware, software conversion, training in hardware and vendor software, and hardware and vendor software maintenance.

Training on the converted software will be the responsibility of the participating agencies (e.g., FWS and BLM).

The version(s) of the software which will be converted by the vendor will be cooperatively determined by Ross Pywell (FWS/NWI), Eric Strand (BLM/DSC), and Charles Gish (FWS/WELUT).

An important development during the meeting, as reported by Charles Gish, was that the DOI was moving forward with the procurement, as currently written, but the Department would entertain amending the Department Procurement Authority (DPA), relative to which agencies were authorized under the procurement, if the Department receives the agency request(s) and pertinent information within approximately two weeks.

Tentative Procurement Schedule

Release RFP	02/15/85
Technical Evaluation	04/15/85
Benchmarks	05/01/85
Best-and-Final Offers	06/01/85
Award	07/15/85
Delivery	12/15/85
Software Conversion	03/15/86

D. Cooperative Strategy for Technology Transfer (See Appendix C)

1. Membership/New Membership Procedure

Charter Members:

- BIA, Office of Trust Responsibilities
- BLM, Denver Service Center
- SCS, Cartography and GIS Division
- USFS, Forest Pest Management Methods Application Group
- FWS, Division of Biological Services

New Member (by unanimous vote of the Steering Committee):

- USGS, National Mapping Division

Addendum/Amendment Guidelines for New Membership - The following three guidelines were accepted as requirements on new membership requests for joining the Cooperative Strategy:

- Statement of agency/unit role(s)
- Identify Steering Committee membership
- Signature by agency requesting membership (signer level is at the descretion of the agency)

Signature on a new membership request to the Steering Committee indicates acceptance of the existing Cooperative Strategy statement. The content of the Cooperative Strategy statement, including goals and objectives, may be changed only by vote of the Steering Committee.

Motion:

- Establish a reporting mechanism to the IDCCC and FICCDC on significant activities: Claude Christensen (FWS) named delegate to IDCCC; no decision made on delegate to FICCDC. Both delegate representatives would revolve amongst the agencies on an annual basis.

2. Five-Year Development Plan

Problem: Define a process for dealing with the National MOSS Users Workshop record, EROS Data Center functional design study results, and DOI Computer Procurement.

Needs:

- Mechanism to track efforts
- Mechanism keyed to structured evaluation of state-of-the-art development
- Interagency coordination
- Accomplishment of the five major components of the Cooperative Strategy as listed on pages 2 and 3 of the document

Recommendations:

- Establish a mechanism to act on FY 85 Task Action Plan at next Steering Committee meeting

- Develop line items for meeting agenda

- Conduct additional meetings of Steering Committee

- Obtain agency commitment to the Cooperative Strategy

Motion:

- Establish the chairperson of Steering Committee (Denny Parker [BLM] elected)

Workshop Follow-Up/Action Items:

- User and systems workgroups are requested to "define" recommendations for clarity (request made to user and systems workgroups during meeting).

- The chairperson will notify the Steering Committee (within two weeks of workshop) on dates for distribution of Workshop Proceedings and next Steering Committee meeting (May 1985).

- Each agency will list the recommendations submitted by the user and systems workgroups in priority order, coordinate joint priorities among the other agencies, and present agency priorities at the next Steering Committee meeting.

3. Joint Funding Strategy

Joint funding is restricted to software/systems development.

Develop specific funding objectives, by agency, prior to any request for support from Washington.

A joint funding proposal would carry more weight but would also result in more visibility.

Motion:

- The Steering Committee will prepare a proposal for IDCCC and FICCDC to a initiate funding strategy. The proposal will be prepared at the next Steering Committee meeting.

This initial proposal to IDCCC and FICCDC could be the first of many requests.

4. MOSS "Common" Version Definition/Maintenance

"Common" Version Definition

- No consensus or resolution was reached regarding definition of a "common" version of MOSS.

- "Combined" version is currently the version that FWS and BLM coordinated on and have agreed to enhance in the future. It is not the USGS version recently converted to the VAX.

Maintenance

Problems:

- Numerous versions of MOSS are being run on several systems.

- Enhancements result in a new version, but new versions are not released and enhancements to the older version are stopped.

- There is currently no freeze on versions due to separate maintenance.

- There is no common source of support; some agencies do not have the expertise to maintain a separate system.

- No agency has the FTE's or funding to provide maintenance across agencies.

Recommendations:

- Ensure that each agency reports to the Steering Committee on its MOSS activities.

- Label (name) and date versions of MOSS and document system(s) it is running on.

- Provide hardcopy documentation of release versions.

- Consider joint funding, since this could support release distribution and maintenance.

- Decide on the version of MOSS to be converted.

Decisions:

- The MOSS version for the 32-bit CPU conversion in the DOI computer procurement will become the standard version.

- The centralized maintenance issue will be tabled until the next Steering Committee meeting. This issue will be an agenda item, and each agency should have a position statement for the meeting.

5. Agency Role Definition

Agencies will review all role statements in the Cooperative Strategy and provide clarification of roles at the next Steering Committee meeting.

6. Other

A tentative date of May 1986 has been established for the Third National MOSS Users Workshop.

Nominations have been requested for sponsors of the 1986 Workshop. Nominations should be provided to the Steering Committee chairperson (Denny Parker, BLM).

APPENDIX A

LIST OF WORKSHOP PARTICIPANTS

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APPENDIX B

ABSTRACTS FOR USER PRESENTATIONS

-ABSTRACT-

MOSS USERS CONFERENCE

Oregon GIS Experience

The Oregon Department of Land Conservation and Development and Oregon Department of Energy are partners in a project to:

1. Develop a prototype computer-based Geographic Information System (GIS);
2. Conduct a demonstration project using this GIS in the coastal zone;
3. Assess the capability of the GIS to improve Oregon's response to coastal energy development impacts.

This project is an interagency effort. An ad hoc working group includes 17 state, local, federal and private agencies and groups in Oregon. Primary technical assistance is provided by the U.S. Fish and Wildlife Service Western Energy and Land Use Team (WELUT) in Fort Collins, Colorado, via a Cooperative Agreement. Other technical assistance may be provided by the Oregon State University Geography Department. Digital base maps are being provided by the U.S. Geological Survey and WELUT. The Oregon Executive Department Data Systems Division is assisting in project development. Total project budget is $96,000 federal funds.

The prototype GIS uses a public domain software system developed by WELUT: the Map Overlay and Statistical System (MOSS). MOSS is in use by major federal resource management agencies. It is a user-oriented system designed for use by resource managers.

Project equipment is as self-contained as possible to give Oregon agencies "hands-on" experience. A Data General Desktop-20 microcomputer is the central processing unit. Other equipment allows digitizing of maps and print-out of results in map, text or chart form. Equipment costs are approximately $35,000. Equipment is housed at the Department of Energy.

The Columbia River Estuary region has been selected as the demonstration project area. It is a prime target area for energy-related development, has the potential for significant development/ conservation conflicts and has a rich data base, including digital map data.

Data for the project come from a variety of local, state and federal agencies. Some are already in digital form; other data will be digitized during the demonstration project. Products will conform to USGS map standards.

The Resource Information Management System project will investigate the usefulness of a GIS for local planning problems as well as regional resource management. The ad hoc working group has been asked to suggest "what-if" questions to assess how--or if--a GIS would be useful. An effort is being made to coordinate the RIMS project with the water planning project initiated by SB 523 to ensure the two projects have long-term benefits for the State of Oregon.

The project is scheduled to be completed by December 31, 1984. A project evaluation will be prepared then.

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TERRAIN ANALYSIS AND MOSS

G. Michael Hardaway
Geographic Sciences Laboratory
U.S. Army Engineer Topographic Laboratories

Terrain analysis is the process of analyzing military geographic information to determine the effect of the natural and manmade features on military operations. Present manual terrain analysis procedures require the terrain analyst to collect data for the study area (maps, imagery, reports, and studies), evaluate the data collected (compare the data and select the most correct), prepare a pencil factor overlay from the data collected, and if necessary prepare a manuscript to accompany the factor overlay(s). This manual process can take an analyst anywhere from a week to several months to complete one factor overlay depending on the study area and the specific topic (i.e. surface configuration, vegetation, soils, etc.). These current procedures are too cumbersome and inflexible to satisfy Army requirements for rapid generation, revision and dissemination of terrain information and terrain products. The Terrain Analyst Work Station (TAWS) will enable terrain analysts to satisfy these Army requirements.

The TAWS will allow the terrain analyst to extract information from monoscopic or stereoscopic imagery via a light table mensuration system and analytical stereoplotter, extract information from cartographic sources via a digitizing table, and input data from other digital sources. The information can then be used to rapidly produce and/or update the factor overlays used in the generation of terrain analysis products.

The Map Overlay and Statistical System (MOSS) software on TAWS will be used to produce individual and complexed factor overlays so that they

may be used independently or as inputs to terrain analysis models used in specialized mobility products (i.e. cross-country movement, concealment, drop zones, etc). The MOSS software will also be used to produce hardcopy graphic output of the information compiled using the TAWS. In addition, MOSS may be used to produce special purpose polygon-formatted digital tapes for other systems which require digital terrain data in this format.

In December 1984, testing of the MOSS software on the Geographic Sciences Laboratory's TAWS system was completed. Several problems were found in both the operating system and the MOSS software. As soon as these problems are corrected, retesting will begin. In spring of 1985 the Map Analysis and Processing System (MAPS) software package should be implemented on the TAWS and integrated with MOSS. This will allow processing of raster data and access to the Digital Terrain Elevation Data (DTED). Accessing DTED will allow mobility and intervisibility products to be produced by the TAWS.

AUTOMATED GEO-INFORMATION SYSTEMS IN THE WYOMING STATE OFFICE BUREAU OF LAND MANAGEMENT

BY J. BRUCE KEATING

BIOGRAPHICAL SKETCH

Bruce Keating is the Mapping Science and Remote Sensing Coordinator for the Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming. He has extensive experience in cartography, aerial photographic interpretation, digital remote sensing, and automated geographic information systems. Bruce has presented many training sessions and university courses to technicians and professionals throughout the United States. He was an instructor of cartography and past Director of the Center for Remote Sensing and Cartography, University of Utah, and a former Cartographic-Geodetic Officer with the U.S. Air Force. His professional activities include past National Director of the American Cartographic Association/American Congress on Surveying and Mapping and Certified Photogrammetrist, American Society of Photogrammetry. Bruce is a Major in the Air Force Intelligence Service, Reserves, assigned to the 314th Air Division, Republic of Korea.

ABSTRACT

In the past three years the Wyoming State Office (WSO), Bureau of Land Management (BLM), has installed and made operational an Automated Geographic Information System (GIS) which allows for the digital analysis of spatial data (resource maps) at both the district and State Office levels. The WSO uses the Automated Digitizing System (ADS), Map Overlay Statistical System (MOSS), and the Cartographic Output System (COS) on our Data General M-600 computer with 1200 MB of online disc storage. Major emphasis of the presentation is examples of analytical and cartographic output. Primary applications of this data include:

Land Use Planning	Area Linear Measurements
Soils Analysis	Volume Measurements
Rangeland Analysis	Resource Management Plans
Coal Tract Delineation	Environmental Impact Statements
Unsuitability Criteria	Slope and Aspect Maps
Alternative Ranking	Habitat Management Plans

The GIS system has over 12,000 map overlays digitized in the following themes: land net, surface and mineral ownership, soils, range, wildlife, management boundaries, cultural, slope, aspect, transportation, oil and gas wells, hydrography, etc.

All current funding for data capture has been project directed through a benefiting activity, i.e., soils, range, etc. Current costs to digitize the data are equitable to former acreage measurement functions. The major cost savings are gained with repeated use of the same data; i.e., surface water data digitized for range suitability modeling can be used for wildlife analysis.

The flexibility of auto-GIS greatly exceeds all other digital/manual resource information systems. The user has the ability to both interact with their own data and other data within the system. The ability to automatically overlay and analyze many thematic layers of map data has been proven. We have superimposed digitally over 20 layers of map data for the coal tract selection process. The continued implementation of GIS is reviewed with emphasis on full operational integration in all Wyoming BLM field offices.

PICEANCE BASIN RMP AND FOLLOW-UP APPLICATIONS

George Long
BLM, White River Resource Area

ABSTRACT

The MOSS GIS was utilized to implement the recent federal planning regulations and develop the Piceance Basin Resource Management Plan (RMP). The Piceance Basin contains some of the richest deposits of oil shale in the world and one of the largest migratory deer herds in North America. Because of these and the unique occurrence of other natural resources, the intense land use conflicts between industry, environmental groups, other public interests, and the acute timeframes of the RMP, MOSS was chosen as a test automation of the RMP process. Technical coordinators submitted, reviewed, and developed the data base for the physical and biological sciences. Once these resources were identified and digitized, management priority areas (MPA) were developed for these resources. MPAs incorporate the land use "priority use" zoning concept (lands best suited for a particular use or combination of uses). These MPAs were then developed to reflect the emphasis of each alternative. Next, the MPAs were "rasterized" (for speed of processing in MOSS) and then ranked in specific orders based on the compatibility of each resource and "crossed" to develop the alternative maps. The use of MOSS to automate the land use planning process proved to be a very useful and timely tool for the public land manager. It portrays those land uses foregone or benefited by management decisions. It is also very amendable to changes in management direction and can be quickly adjusted to reflect those changes. The data base used for the plan can also be utilized for subsequent site specific or activity plans required by the RMP.

GEOCHEMICAL DATA ANALYSIS FOR MINERAL RESOURCE ASSESSMENT
by G. D. March

MOSS is being used by the Alaska Division of Geological and Geophysical Surveys to facilitate mapping of geochemical anomalies in northwest Alaska as input to a mineral assessment of the area. A mineral assessment was requested by the Department of Natural Resources as a component of their Northwest Area Plan effort.

NURE geochemical data is the primary input to the MOSS maps, supplemented by all geochemical surveys available in the literature. Data is organized on a 1:250,000 quadrangle basis. Geochemical data values are entered from tape (NURE) and by hand through specialized geochemical data programs written by ERDAS, Inc. Sample points from the literature are digitized using AMS to obtain geographic coordinates for the geochemical data. Histograms of the data for 19 elements are made using BMDP, and the histograms are used to determine threshold values for the elements. Generally the populations are normal, and the top 5% of each element is considered anomalous.

Map points are added to MOSS and geochemical data becomes a multiple attribute file. A MOSS map is then made for each element from each data set using BSEARCH, and the maps are saved and assigned symbols for each different element. The data sets for each element are then combined into element suites, five suites for each quadrangle. Using this method, anomalous points for each data set are combined to produce easily readable maps which can be used to determine combinations of geochemical anomalies that exist in an area.

USER MANAGEMENT CONCERNS FOR MANAGEMENT AND IMPLEMENTATION OF GEOGRAPHIC INFORMATION SYSTEMS

Jeffery Sherman Nighbert
Geographer, Bureau of Land Management

The Bureau of Land Management in New Mexico has had an implemented GIS for approximately three years. The fundamental software utilized in this system is the MOSS. The system is implemented in a distributed user environment with seven complete digitizing stations statewide and over 40 registered MOSS users.

The world of GIS and MOSS from the user management perspective offers a different set of problems areas and concerns than from the users perspective. Users have traditionally pinned failures and problems on poor or faulty programs or lack of computer power.

From the vantage point of the user management, software problems or "bugs," as they are sometimes called, is the least of problems. MOSS project failures have more to do with project planning, data base management, and computer capacity planning. Unfortunately, there was only allowance at this workshop for presentation of one central concern of user management in an operational GIS--storage capacity.

Fundamentally, storage capacity can affect software performance, data management abilities, and data security. Insufficient storage capacity can also cause interruptions in service, therefore it is an important factor in success or failure of any GIS project.

Storage capacity planning is a necessary part of overall GIS project planning. If the project requirements are adequately defined in this process, storage capacity requirements can be accurately predicted. Storage requirements for a project can be calculated given this formula:

R = (no. of quads) x (average bytes per quad) x (1 + no. of manipulations)

For each map theme in a project this formula must be used. The need can be attained by adding the results for each theme. Other factors may be included in the formula such as the data base swell factor for file duplications or multistep processing.

Admittedly, more research is required for development of more accurate measures for storage capacity. However, in the long run a more efficient means of storing coordinate data should be investigated.

MOSS USERS WORKSHOP PRESENTATION

Title: Visual Assessment of Mine Waste Disposal
Presenter: Butch Smith

Abstract

Rio Blanco Oil Shale Company has presented a proposal to the BLM to lease 6,400 acres of public land for the disposal of 3 to 4 billion cubic yards of spent oil shale and overburden. The project would be one of the largest earth moving projects in the world, and would drastically alter the existing environment and earthform. GIS/MOSS is currently being used to assess the potential visual impacts of the project. Assessment is being accomplished by use of the "three-dimensional" capabilities of MOSS and also by use of the VISTA command. Both commands are used in conjunction with Digital Elevation Models. These applications have stimulated new software developments.

MOSS and FOREST PLANNING

Jay Stephan
Nicolet National Forest

The Nicolet National Forest is using MOSS to help implement the Forest Plan. Through linking the Forest Planning Model (FORPLAN), our Timber Management System (TMIS), and MOSS, we are able to locate those acres recommended for harvest during the Plan's first decade. After locating these acres, we can define and schedule possible project areas and determine needs for roading, property boundaries, cultural resource protection, and threatened and endangered species consideration.

INTEGRATED PEST IMPACT ASSESSMENT SYSTEM UPDATE

William B. White
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ABSTRACT

In recent years, USDA Forest Service, Forest Pest Management personnel have been involved in developing methods for assessing impacts of forest pests. The result of much of this work is the Integrated Pest Impact Assessment System (IPIAS). This system combines features of the U.S. Fish and Wildlife Service's geographic information system (MOSS); a set of models representing mountain pine beetle (MPD) dynamics, forest stand growth and yield, and socioeconomic impacts; and a System 2000 forest data base.

In addition to the above components the Adaptive Environmental Assessment Group, U.S. Fish and Wildlife Service (WELUT) facilitated a workshop where procedures were outlined to be followed in developing a contagion (risk or hazard rating) model for mountain pine beetle in lodgepole pine forests for integration into IPIAS. Two major components: (1) a mountain pine damage model; and (2) a contagion model, were developed.

In developing a mountain pine beetle damage model participants avoided the usual population dynamics approach. The advantages of not having an explicit representation of mountain pine beetle numbers is the avoidance of many nonquantified relationships that would otherwise be required. The primary calculations in the mountain pine beetle model include: (1) hazard indices based on stand characteristics; (2) trees killed; (3) a mountain pine beetle brood production index; (4) the probability of an outbreak starting or growing; and (5) the new beetle index based on current year's brood production and dispersal.

The contagion model will then calculate how the beetles, and related tree mortality, will spread to surrounding stands. Several different approaches to representing this phenomenon were discussed. A modification of a dispersal matrix (grid cell) approach previously used to model dispersal of spruce budworm was proposed as a starting point.

Second National MOSS Users Workshop, Denver, Colorado, January 21-25, 1985

GIS APPLICATIONS AND STATUS IN THE PORTLAND AREA BUREAU OF INDIAN AFFAIRS

The first full year of having an operational GIS activity has produced digital data bases for twenty-four Reservations with the remainder in the planning stage. This is well into the third year of planned effort.

The Warm Springs Range Management Plan has been completed utilizing GIS and is now being modified and implemented using the GIS data base. Projects are now underway in forest management and timber sale planning, and the Boise Interagency Fire Center is participating in a Fire Management planning effort.

The Yakima Reservation Soils Project is on schedule, with other uses in Forest Management and an irrigation project is in the planning stage. In terms of stored GIS data, the Yakima Reservation currently is the largest contiguous GIS-MOSS data base in existence, and is a major user of USGS Digital Data.

Other projects underway include the MOSS-RIVERREACH fisheries project at Tulalip, a lease mapping project at Umatilla, and an irrigation analysis project at Fort Hall.

Response to the program has been outstanding and the work accomplished has shown the GIS technology to be very cost effective. However, continued support and implementation of GIS in the Area is critically dependent upon acquisition of the necessary computer equipment and hardware. We are finding the transitions from a testing and development mode to an independent fully operational mode to be more difficult then anticipated, especially with equipment procurement freezes and funding delays. We are also examining our dependency upon other entities for services and recognizing that we may have to develop more in-house capability then originally intended.

Emphasis in 1985 will be on adding to existing data bases; bringing the system operational at the field level; developing in-house digitizing and data base management capabilities; developing alternative contract digitizing sources; and developing capabilities to utilize remote sensed data in conjunction with the MOSS data bases and applications.

The Departmental GIS equipment procurement contract will have an impact on our configuration, but we are still intending to emphasis "desk-top" techology for field installations versus networking to a main frame. We plan to remain committed to MOSS and support its enhancement and development.

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APPENDIX C

COOPERATIVE STRATEGY FOR TECHNOLOGY TRANSFER

Cooperative Strategy for Technology Transfer:

Bureau of Indian Affairs, Office of Trust Responsibilities (BIA-OTR)
Bureau of Land Management, Denver Service Center (BLM-DSC)
Soil Conservation Service, Cartography and Geographic Information Systems Division (SCS-CGIS)
U.S. Forest Service, Forest Pest Management's Methods Application Group (FS-FPM)
U.S. Fish and Wildlife Service, Division of Biological Services (FWS-DBS)

I. Introduction

In August 1977, the Bureau of Land Management, Denver Service Center (BLM-DSC) and the U.S. Fish and Wildlife Service, Western Energy and Land Use Team (FWS-WELUT) entered into a Memorandum of Understanding (MOU; FWS-14-16-0009-77-943). This MOU recognized the delegated authorities of each agency in the development of resource inventory and evaluation techniques, and the need to establish coordinated and integrated programs in several areas. One important area was, and is, "... to ensure ... that ... information storage, retrieval, display and update systems provide compatible data bases accessible to both agencies." On July 15, 1982, a Cooperative Strategy for Technology Transfer was implemented between BLM-DSC and FWS-WELUT.

The implementation of the original Cooperative Strategy included an outreach objective to inform other agencies of the strategy and its accomplishments. This has resulted in requests to expand participation in the Cooperative Strategy, its goals and objectives. Further, at least 5 Memoranda of Understandings (MOU's) and Interagency Agreements (IAG's) exist among the above named participants in this Cooperative Strategy (see Table 1). This

Table 1. Current Memoranda of Understandings (MOU's) and Interagency Agreements (IAG's) in effect among the cooperating agencies related to the scope of the Cooperative Strategy for Technology Transfer.

Interagency Agreement Related to Classifications and Inventories of Natural Resources - Bureau of Land Management, Forest Service, Fish and Wildlife Service, Soil Conservation Service, Geological Survey

Memorandum of Understanding for Transfer of Automated Data Processing (ADP) and Networking Technologies and Expertise - USDA Office of Information Resource Management, Fish and Wildlife Service

Interagency Agreement to Provide for Database Construction and Geographic Information System Functional Capability Comparison - Soil Conservation Service, Fish and Wildlife Service

Memorandum of Understanding to Provide a Vehicle for the Transfer of Advanced Natural Resource Inventory and Analysis Technology from the Service to the Bureau and to Enhance and Support the Continued Development, Maintenance, and Transfer of Computer Based Technologies and their Applications - Bureau of Indian Affairs, Fish and Wildlife Service

Interagency Agreement for Applying Advanced Computer Technology to Natural Resource Management and Support of Forest Pest Management's Methods Application Group's Integrated Pest Impact Assessment System - Forest Service, Fish and Wildlife Service

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Cooperative Strategy is consistent with the objectives of OMB Directive No. M-83-12, April 4, 1983, which calls for better coordination by Federal agencies in Federal digital cartographic data programs.

II. Purpose

The "Interagency Agreement Related to Classifications and Inventories of Natural Resources" (referred to as the Five-Way) required coordination of a number of the elements of technology currently applied to natural resource assessment. Pursuant to the Five-Way and other agency needs, are a variety of MOU's and IAG's that exist between and among BIA-OTR, BLM-DSC, SCS-CGIS, FS-FPM, and FWS-DBS. To effectively pursue the intent of these responsibilities, the above named parties have developed a Cooperative Strategy to evolve compatible geographic information system technologies and data bases. Components of this strategy include:

1. Joint definition of common core system components;

2. Defining the scope of technology factors of mutual interest and concern, including development, maintenance, and transfer;

3. Identifying specific needs for coordination and cooperation related to technology transfer, including training;

4. Implementing specific tasks, both within and between organizations, toward the accomplishment of this strategy; and

5. Evaluating the progress, direction and effectiveness of the strategy and its elements on a periodic basis.

III. Responsibilities and Roles

General. It is recognized that the above named agencies have developed unique capabilities for providing computer resources in order to perform functional processing of digital data for land resources analysis applications. This combined experience and knowledge can be mutually beneficial in the accomplishment of their specific missions.

The parties to this Cooperative Strategy will take advantage of their complimentary experience and resources to insure cooperative development of software for processing raster and vector data and related information. This coordinated effort will result in cost savings and improve efficiency through sharing of development and maintenance resources and interchange of software. Future developments will be coordinated between the organizations and the results shared. Each agency will define their needs and formulate proposed developments and system changes for review and concurrence by a joint steering committee. Specific tasks will be identified for each agency and the lead responsibility for each task will be assigned to an agency representative.

BIA-OTR. The BIA has a trust responsibility for management of Indian natural resources for more than 52 million acres of land. In carrying out this trust responsibility, the Bureau has implemented a developmental program within its Program Coordination Staff, Office of Trust Responsibilities, to assure that state-of-the-art capabilities exist for its program areas; to assist management and policy development; and to provide assistance to field offices and tribes in the protection, management, and development of their trust resources.

BLM-DSC. The Denver Service Center has the overall responsibility in the BLM for providing support to twelve State offices in terms of technical development (applied research, development, technology transfer, and implementation), operations, and assistance. Specific areas of responsibility include remote sensing, computer graphics, and the associated geographic information system.

SCS-CGIS. The Cartography and Geographic Information Systems (CGIS) Division has the national leadership role in the Soil Conservation Service for developing cartography, remote sensing, and geographic information system techniques to support soil and water conservation and associated planning activities. In service to all branches of SCS, the CGIS Division, in coordination with the National Cartographic Center, has the responsibility to identify and investigate new digital cartography, remote sensing, and GIS technologies and to develop, test, and evaluate this technology for application in SCS.

FS-FPM. The Forest Service's Forest Pest Management's Methods Application Group is charged with the development, demonstration, and technology transfer of rapid, more accurate methods for determining the impacts of forest pests upon our nation's renewable natural resources. Computer-based methodologies are an important component of the program, as well as technical assistance to the National Forest System in the operational application of these methodologies to management of public and private lands.

FWS-DBS. The Division of Biological Services, U.S. Fish and Wildlife Service, is charged with the development of needed information and technology for transfer and application in the planning of natural resource management. Although the primary users of DBS information and technology are operational offices of the FWS, a major effort involves applications assistance with DBS technologies to a wide spectrum of Federal and State agencies, and the private sector. Within DBS, the Western Energy and Land Use Team (WELUT) represents the primary focus for the development of computer-assisted resource management techniques. At the present time, WELUT and its sister unit, the National Coastal Ecosystem Team (NCET), represent the major operational support capability within the FWS for information systems applications and transfer assistance.

IV. Strategy Elements

Overview. A wide array of information systems and components, including both software (e.g., computer programs) and hardware (e.g., electro-mechanical

devices) are currently available to agencies. An even larger set of data sources (e.g., what information systems process) exist that agencies require access to in the pursuit of their respective missions. From a technical standpoint, it is convenient to focus on discrete software systems, with an eye to data set compatibility and hardware requirements for effective technology transfer. From a management standpoint, as well as the information system users, it is useful to focus on processes to guide technical activities. Thus, this Cooperative Strategy consists of the following combination of management and technical perspectives: (1) goals and objectives to guide technical activities, and (2) the subsequent development of tasks that specify both required and desirable technical accomplishments. The goals and objectives are given below:

Goal 1 - To ensure continued cooperation in the development, maintenance and transfer of specified information systems.

Objective 1.1 - Identify software components of mutual interest and concern that require cooperative efforts to appropriately guide their future evolution.

Objective 1.2 - Achieve specified compatibility, interchange, and training in the use of data entry systems.

Objective 1.3 - Achieve specified compatibility, interchange, user assistance, and training in the use of data management systems.

Objective 1.4 - Achieve specified compatibility, interchange, user assistance, and training in the use of data analysis systems.

Objective 1.5 - Coordinate all systems life cycle activities for the Map Overlay and Statistical System (MOSS), including priorities for changes, procedures for releases and acceptance, maintenance, transfer, training, and user assistance.

Objective 1.6 - Achieve specified compatibility, interchange, user assistance, and training in the use of product output systems.

Goal 2 - To assure continued coordination in the exchange of knowledge regarding information systems of potential mutual interest and/or concern.

Objective 2.1 - Determine appropriate individuals and schedule assignments to exchange knowledge on information systems on a continuing basis.

Objective 2.2 - Communicate items of interest from this cooperative strategy to other natural resource agencies and appropriate entities on a continuing basis, including sponsorship of an annual MOSS User's Workshop.

Objective 2.3 - Provide coordinated input to the Federal Agency and Interior Digital Cartography Coordinating Committees (FADCCC and IDCCC) regarding requirements and standards.

Goal 3 - To ensure continued accessibility and operational compatibility of specified data sources with information systems of mutual interest.

Objective 3.1 - Specify requirements for technical modification of information systems of mutual interest/concern to effect acceptance of identified data sets on a continuing basis.

Objective 3.2 - Develop process and procedures for storage and retrieval of spatial information (hard copy and digital).

V. Implementation Strategy

Technical processes. The implementation of this Cooperative Strategy will be through specified tasks. Specific action/activity planning required to accomplish tasks agreed to by the responsible agency will be developed as required, in concert by responsible designees from each agency.

Management processes. Cooperating agencies agree to facilitate the accomplishment of the tasks identified through this strategy by:

1. Establishing joint priorities for tasks requiring cooperation and/or resources from two or more agencies;

2. Promoting the approval of tasks and required resource allocation within each agency's planning and budgeting procedures;

3. Providing reciprocal assistance as appropriate in obtaining new or additional resources required to carry out priority tasks under this cooperative strategy;

4. Conducting reviews of progress, accomplishments, and problems encountered in the pursuit of tasks under the strategy; and

5. Evaluating the effectiveness of resultant products and determining appropriate modifications and additions to the elements of this strategy.

Implementation of both management and technical processes will be the responsibility of a Steering Committee (see VI below). The Steering Committee may charter specific Work Groups to carry out particular goals and/or objectives.

VI. Steering Committee

The Steering Committee shall convene at least semi-annually; Chairmanship will revolve yearly among the participating agencies. Membership will consist of no more than two participants from each participating agency, as delegated by the approving official for each cooperator. Observers may be included in any activities as deemed appropriate by each cooperator.

Steering Committee Membership

BIA-OTR

1. Information Systems Officer, Office of Trust Responsibilities
2. Geographic Information Systems Coordinator, Office of Trust Responsibilities

BLM-DSC

1. Assistant Director, Technical and Scientific Systems
2. Chief, Division of Advanced Data Technology

SCS-CGIS

1. Director, Cartography and Geographic Information Systems Division
2. Geographic Information Systems Coordinator

FS-FPM

1. Director, Methods Application Group
2. Impact Specialist, Method Applications Group

FWS-DBS

1. Team Leader, Western Energy and Land Use Team
2. Team Leader, National Coastal Ecosystems Team

VII. Duration and Limitations

This strategy is effective on the date of last signature. The content of this strategy may be modified, including addition of cooperators, by agreement of the Steering Committee. Termination of participation by any cooperator may be effective 90 days from date of written notice to the Steering Committee Chairman. A formal review of this instrument is required at least every 5 years.

This document does not replace, modify, or supercede any MOU's or IAG's presently established. Its primary intent is to avoid unnecessary duplication of effort through cooperative planning and accomplishment of present and future responsibilities within and between the signatory parties.

Approved by:

Acting Director, Office of Trust Responsibilities, Bureau of Indian Affairs
Date 11/6/84

Director, Denver Service Center, Bureau of Land Management
Date 10-19-84

Director, Cartography and Geographic Information Systems Division, U.S.D.A., Soil Conservation Service
Date 11/16/84

Group Leader, Forest Pest Management, Methods Application Group, U.S.D.A., Forest Service
Date 10-29-84

Chief, Division of Biological Services, U.S. Fish and Wildlife Service
Date 9/26/84

Addendum to

Cooperative Strategy for Technology Transfer:

U.S. Geological Survey, National Mapping Division (USGS-NMD)

USGS-NMD - The National Mapping Division (NMD) maintains a network of spatial data processing systems dedicated to supporting a variety of image processing and spatial data handling functions. These functions are developed and maintained to assure that the National Mapping Division is responsive to the needs of the U.S. Geological Survey, and other Department of Interior bureaus for digital processing and application of earth resources data. These requirements include handling and processing of spatial data for image mapping, automated cartography, multiple data base development and earth resources information systems applications.

Steering Committee Membership

USGS-NMD

1. Chief, Office of Geographic and Cartographic Research
2. Chief, Spatial Data Technology Office, EROS Data Center

Approved by:

H. B. Mathard

Chief, National Mapping Division
U.S. Geological Survey
Date: 1/14/85

APPENDIX D

MOSS PROBLEMS IDENTIFIED IN 1984 AND 1985 AS NEEDED FIXES AND STATUS OF ALL FIXES TO SOFTWARE PROBLEMS

MOSS PROBLEMS IDENTIFIED IN 1984 AS NEEDED FIXES

1. OVERLAY
   a. Area summaries for the resultant map can be inconsistent with areas in the original data.
   b. This command may fail to produce a product map.
   c. The product map may have incorrect intersections.
   d. Islands may be incorrectly assigned in the product map.
   e. This command takes a significant amount of time to execute.
   f. The UNION and NOT options do not work.
   g. The ten-character map name is too confining.
   h. The non-default subject merge does not put the new map in the POLYGON.DT file; however, it is created on disk.
   i. The product maps need a unique location in addition to the POLYGON.DT file.
   j. The LPOVER overlay command drops lines.
2. MERGE
   a. The 1,000-subject limit is too confining.
   b. The 22-map limit is too confining.
   c. This command does not dissolve quadrangle boundaries.
3. RASTERIZE POLYCELL
4. RESTART
   a. The RESTART option for the sign-on gave incorrect results after repeated use.
5. SELECT
   a. The FROM option sets the graphics file to 0.
   b. Bounded select capabilities should be implemented for all maps.
6. BUFFER
   a. The resolve overlap option does not work properly.
   b. This command does not execute properly with complex data or polygon data.
   c. A buffer zone of more than one mile is unreliable.

7.	ADD	a. This command does not flag maps that surpass limitations of MOSS maps.
8.	STATUS	a. The JOB option produces an incorrect count on the number of active IDs.
9.	ACTIVE	a. The CONTIGUITY and SAMPLE commands change the active table.
10.	WEED	a. This command may leave gaps or overlaps in polygons or lines.
		b. The limitation of 1,000 as the maximum number of coordinate parts in a single feature is too confining.
11.	OPEN	a. This option in MAPS does not allow multiple users to access the same data bases.
12.	SHADE	a. This command does not allow for the stringing or concatenation of commands.
		b. The execution of this command requires too much time to be effective in an interactive mode with complex data.
		c. Shade tables should be made available to the user.
13.	EDGE	a. Active maps used in this command must have a single subject to product correct results.
		b. The length summaries for the product maps are incorrect.
14.	ZONE	a. The execution of this command requires too much time.
		b. This command does not allow for the option of specifying English or metric measurements.
		c. This command does not retain the original values of the source map.
15.	BROWSE	a. This command cannot list information for maps that are not permanently retained on the system.
		b. This command does not show the status of archived files.
16.	AREA AUDIT	a. These commands do not allow the option to erase the screen, defaulting to erase the screen each time they are executed.
17.	SAMPLE	a. This command does not allow plotting of the new map without executing the SAVE command.
		b. The limitation of a maximum of 100 features in the source map is too confining.

18. PERIMETER	a.	This command executes on-line and point data but is only valid for polygon data.
19. TEXT	a.	This command has overwrite problems which make it difficult to use in a single terminal mode.
20. DISTANCE	a.	This command does not provide the option for shortest or longest distance in the PATH option.
	b.	This command cannot cross nodes in the PATH option.
21. UTILITY DELETE/ ITEMS	a.	This command does not renumber items after one is deleted, making the deletion of multiple items difficult or, in some cases, impossible. In addition, it cannot be determined whether commands that utilize item numbers are affected (SELECT QUERY).
22. TRANSLATE	a.	This command does not allow the user to effectively specify rotation.
23. LABEL	a.	This command does not allow the user to specify the attribute location.
24. BSEARCH	a.	This command can be executed only with numerical data.

MOSS PROBLEMS IDENTIFIED IN 1985 AS NEEDED FIXES

1. ASSIGN
   a. Good documentation is one of the major problems with the ASSIGN command, making proper execution more difficult and at times confusing to the user.
   b. Inconsistency results when using this command with different data types. Users want consistency in the execution of this command regardless of data type.
   c. Option 1 of the ASSIGN command must be selected prior to the extra step before the desired function can be executed.
   d. The option to assign by features in a map does not work even though it appears to do so in the documentation.

2. CALCOMP
   a. The attribute assignment documentation needs to be improved.
   b. Pens do not switch colors as designated in the command. This has not been a problem at all installations.
   c. This command does not accommodate the labels for polygons or annotate/text files that begin within but end outside the map window; this results in clipping the text at the map border.
   d. The bar scale has overwrite problems.

3. DELETE
   a. The DELETE command does not work 100 percent of the time, requiring the user to use AOS to purge the file from the disk.

4. FLOOD
   a. The SHOW ME COLORS sequence required for the FLOOD command responds with an error message the first time it is executed in a MOSS session. The command still works properly but the error message could cause confusion.

5. FREE
   a. The FREE command option does not work when the active table is full.

6. FUNCTION
   a. The FUNCTION command in the cell processing package or (MAPS) does not work properly.

7. GENERATE
   a. The GENERATE command has overwrite problems, making it difficult to enter or create multiple map features or items. It has been recommended that users apply two terminal mode when executing GENERATE; however, 99 percent of the users have only one terminal, making this suggested solution unacceptable.

8.	LOCATE	a. Northing and easting coordinates are sent to the LINE.PRINTER file in reverse order compared to all other vectors coordinate files that are imported or exported from MOSS.
		b. No method exists for immediately relating coordinates with the points indicated in the LINE.PRINTER file.
9.	PROJECTION	a. The projection package exports incorrect coordinate values for geographic and state plane projections.
10.	RASTERIZE POLYCELL	a. A value of 0 is assigned to cells that are occupied equally by two subjects (50 percent forest and 50 percent water). This requires the user to edit the values of those cells to allow for additional manipulation and analysis of the data.
		b. POLYCELL had a problem with a requested cell size value of 2.47 acres (State of Alaska).
11.	RENAME	a. This command did not work properly because links were not resolved after it was executed.
12.	SELECT	a. The SELECT command does not warn users that their active ID table is full. Thus execution can result in a fatal error.
13.	TEXT (MAPS)	a. ZOOM changes the scale of the text that is entered.
		b. The user must exit the TEXT operation to redisplay the file.
		c. It can be difficult to identify the text to be edited with the crosshairs because of the location of the coordinate used to reference it in the map window.
14.	TO1MOSS	a. The conversion of MOSS work files to the data format required by MOSS since its integration with MAPS does not correctly calculate the Minimum Bounding Rectangle (MBR). The MBR is always set to a 7.5-minute quadrangle originating from the southwest-most coordinate in the map to be reformatted.
15.	UTILITY	a. The RENAME in DATABTEST does not reassign a map name to an existing map.
		b. The DLG2MOSS option accounts for only the first of two major/minor attributes from the DLG file.
		c. The LEGEND option is not properly documented or does not function properly. However, it could not be determined whether the problem occurred in the code or the documentation (users suspect errors in both places).

16. The maps in the MOSS cell format vary in their array sizes, making it difficult to effectively conduct comprehensive analyses. These array sizes should be made consistent with those in the MAPS cell format.

17. The prompts that utilize the crosshair cursor are inconsistent between commands, resulting in confusion and inefficient execution. All prompts throughout the system should be made consistent.

STATUS OF FIXES TO PROBLEMS IDENTIFIED IN FY 85

1. ASSIGN
   a. Not completed
   b. Not fixed
   c. Not fixed
   d. Not fixed

2. CALCOMP
   a. Not completed
   b. Not fixed ?
   c. Not fixed
   d. Not fixed

3. DELETE
   a. FIXED JANUARY

4. COPY
   a. FIXED JANUARY

5. FREE
   a. Not fixed

6. FUNCTION
   a. FIXED JANUARY

7. GENERATE
   a. Not fixed (requires refresh graphics)

8. LOCATE
   a. Not fixed

9. PROJECTION
   a. Not fixed

10. POLYCELL
    a. Not fixed (needs to be verified)

11. RENAME
    a. Not fixed

12. SELECT
    a. Not fixed

13. TEXT
    a. Not fixed
    b. Not fixed
    c. Not fixed

14. TOlMOSS
    a. FIXED JUNE

15. UTILITY
    a. Not fixed
    b. FIXED JANUARY
    c. Not fixed

16. FIXED JANUARY

17. DESIGN IN PROGRESS

STATUS OF FIXES TO PROBLEMS IDENTIFIED IN FY 84

1.	OVERLAY	a.	DESIGN COMPLETED 1985
		b.	DESIGN COMPLETED 1985
		c.	DESIGN COMPLETED 1985
		d.	DESIGN COMPLETED 1985
		e.	DESIGN COMPLETED (this may be a long-standing problem)
		f.	FIXED FOR SOME CASES (see documentation) DESIGN COMPLETED
		g.	Not fixed (this is an overall systems problem not unique to the OVERLAY command but has been expanded in the MAPS package)
		h.	FIXED MAY 1984
		i.	Not fixed
		j.	FIXED 1984
2.	MERGE	a.	FIXED 1984
		b.	Not fixed (work-around is to do multiple executions of the command)
		c.	DESIGN COMPLETED 1985 (this capability is scheduled to be completed in ADS in 1985 and tentatively scheduled for AMS in 1986)
3.	RASTERIZED POLYCELL	a.	FIXED JANUARY 1985
4.	RESTART	a.	FIXED MAY 1984
5.	SELECT	a.	FIXED 1984
		b.	Not fixed
		c.	FIXED 1984
		b.	Not fixed (this fix would be an enhancement)
		e.	FIXED 1984
6.	BUFFER	a.	FIXED 1984 (point data and some line data but not fixed for all data)
7.	ADD	a.	Not fixed
8.	STATUS	a.	FIXED 1984
9.	ACTIVE	a.	FIXED 1984
10.	WEED	a.	DESIGN COMPLETED 1985
		b.	FIXED 1984
11.	OPEN	a.	FIXED 1984
12.	SHADE	a.	FIXED 1984
		b.	Not fixed
		c.	FIXED 1984 (for cell data only; not fixed for polygon data)

13.	EDGE	a. DESIGN COMPLETED 1985 (USGS) b. FIXED 1984
14.	ZONE	a. Improved but not fixed b. Not fixed but a manual conversion could be made prior to command execution c. FIXED 1984 (see the PROXIMITY command for cell processing)
15.	BROWSE	a. Not fixed b. Not fixed
16.	AREA	a. Not fixed (the solution is better planning of command sequence)
17.	SAMPLE AUDIT	a. FIXED 1984 b. FIXED
18.	PERIMETER	a. Not fixed
19.	TEXT	a. Not fixed (requires a refresh graphics terminal)
20.	DISTANCE	a. Not fixed b. Not fixed
21.	UTILITY DELETE/ ITEMS	a. Not fixed
22.	TRANSLATE	a. FIXED 1985
23.	LABEL	a. User can specify the location with the MOVELABEL option in the UTILITY command
24.	BSEARCH	a. FIXED JUNE 1985

APPENDIX E

MOSS ENHANCEMENTS IDENTIFIED IN 1984
AND
STATUS OF ENHANCEMENTS AS OF JUNE 1985

MOSS ENHANCEMENTS IDENTIFIED IN 1984

1.	AMS/ADS MOSS	a.	Install ADS to MOSS.
		b.	Install AMS to MOSS.
		c.	Install MOSS to AMS.
2.	ANNOTATE	a.	Provide capability to move text as specified with crosshair.
3.	ARC-NODE	a.	Change data structure to arc-node.
4.	ASSIGN	a.	Install ability to assign to multiple maps at one time.
5.	BATCH	a.	Improve batch capabilities to string all commands.
6.	BUFFER	a.	Develop capability to generate more than one zone.
7.	CALCOMP	a.	Develop ability to use descriptive titles for maps.
		b.	Develop ability to specify a default legend box.
		c.	Provide capability to assign symbol, size, etc., by active ID.
		d.	Provide capability to display and legend more than 10 maps.
		e.	Install CALCOMP capabilities in MAPS.
8.	CORRIDOR	a.	Develop capability to delineate an optimum corridor between two points.
9.	COS	a.	Build capability to specify multiple maps with templates.
10.	COST	a.	Upgrade to show CPU time and elapsed time.
11.	CROSS	a.	Provide blanket assignments of values and attributes.
12.	DBMS	a.	Integrate MOSS with a DBMS.
13.	DELETE	a.	Improve to work with a literal character search string.
14.	DISTANCE	a.	Install capability to cross segments.
15.	EDIT	a.	Improve capabilities to edit text.
		b.	Improve capabilities to edit graphics.
16.	LORAN	a.	Install LORAN C capabilities in the projection package.
17.	MACRO	a.	Provide the capability to create new commands consisting of multiple existing commands.
18.	MAPS	a.	Install the remaining MAPS commands (STREAM, SPREAD, CLUMP, BROWSE, PROFILE, SHADE, EDGE, SPAN, STATISTICS, CROSSTABS, and HISTOGRAM).
19.	MERGE DISSOLVE	a.	Install the capability to merge maps and dissolve quad boundaries of subject boundaries.

20. MERGE MAPS
    a. Enhance to keep subjects and merge by subject.

21. MILEPOSTS
    a. Develop capability to specify mileposts or distance markers on line data.

22. MOVELABEL
    a. Develop capability to position attributes.

23. NEWS
    a. Provide messages available at log-on.

24. PLOT
    a. Install color capabilities with vector data.
    b. Increase speed of plotting.
    c. Fix plotting of point data.

25. QUERY
    a. Install a repeat option.
    b. Install capability to query in MAPS without specifying a map name.
    c. Improve the resolution of QUERY to hit every cell.

26. RASTERIZE POLYCELL
    a. Increase the maximum number of columns to 4,096.
    b. Enhance all raster functions to work with a maximum of 4,096 columns.

27. SAVE
    a. Provide ability to save derived products (text and line data).

28. SELECT
    a. Develop capability to select by subject in raster data.

29. STATISTICS
    a. Provide for calculation of mean area by subject.
    b. Interface with SAS.
    c. Improve graphics for statistics and plotter output.
    d. Install multivariate cluster analysis.
    e. Improve user manipulation of histogram capabilities.
    f. Increase matrix limitations to 4096 by 4096.

30. TREND SURFACE RESIDUAL
    a. Develop trend surface and residual analysis capabilities.

31. UTILITIES
    a. Enable utility functions to be executed from MOSS.

32. ZOOM
    a. Install capability to create a new map from ZOOM.

33. Improve the user interface.

    a. Make syntax the same.
    b. Eliminate redundancy.
    c. Consolidate commands.
    d. Standardize command abbreviations.
    e. Standardize prompts and defaults.
    f. Make all commands prompted.

34. Provide the capability to identify a location by typing in coordinates.

35. Give the user the capability to use bounded prompts specifying a range of active map IDs.

36. Improve error messages for ease of understanding.

37. Provide the capability to separate text and graphic input and output.

38. Provide the capability to convert from raster to vector data formats.

STATUS OF ENHANCEMENTS AS OF JUNE 1985

1.	AMS/ADS MOSS	a. b. c.	DESIGN COMPLETED, SCHEDULED COMPLETION AUGUST 1985 Not scheduled DESIGNED COMPLETED
2.	ANNOTATE	a.	FIXED IN THE TEXT COMMAND MARCH 1984 (capability does not exist for old text files constructed with the ANNOTATE command)
3.	ARC/NOTE	a.	DESIGN COMPLETED 1985
4.	ASSIGN	a.	Not scheduled
5.	BATCH	a.	DESIGN COMPLETION SCHEDULED FOR SEPTEMBER 1985
6.	BUFFER	a.	Not scheduled
7.	CALCOMP	a. b. c. d. e.	INSTALLED MARCH 1984 Not installed Not installed Not installed INSTALLED JANUARY 1985
8.	CORRIDOR	a.	Not scheduled
9.	COS	a.	DESIGN COMPLETED 1985
10.	COST	a.	Not installed
11.	CROSS	a.	INSTALLED JANUARY 1985
12.	DBMS	a.	DESIGN COMPLETED 1985
13.	DELETE	a.	Not scheduled
14.	DISTANCE	a.	DESIGN COMPLETED 1985
15.	EDIT	a. b.	PARTIALLY COMPLETED (needs user specifications to be refined) DESIGN COMPLETED FOR LINE DATA JUNE 1985
16.	LORAN-C	a.	Not scheduled
17.	MACRO	a.	DESIGN INITIATED 1985
18.	MAPS	a.	DESIGN COMPLETED FOR ALL (SHADE INSTALLED)
19.	MERGE DISSOLVE	a.	DESIGN COMPLETED, SCHEDULED COMPLETION 1985 (ADS) DESIGN COMPLETED, DISSOLVE OPTION COMPLETED 1985 (AMS)
20.	MERGE MAPS	a.	Not installed (renumber and then merge)

21.	MILEPOSTS	a. Not scheduled
22.	MOVELABEL	a. INSTALLED MARCH 1984
23.	NEWS	a. INSTALLED MARCH 1984
24.	PLOT	a. INSTALLED 1984 b. IMPROVED (the question remains of how fast) c. FIXED 1984
25.	QUERY	a. INSTALLED 1985 b. Not installed c. INSTALLED 1984
26.	RASTERIZE POLYCELL	a. Maximum on 16-bit is 10,000,000 cells b. Maximum on 16-bit is 10,000,000 cells
27.	SAVE	a. INSTALLED 1984
28.	SELECT	a. Not scheduled
29.	STATISTICS	a. INSTALLED 1984 b. Direct interface not completed c. Not scheduled d. Not scheduled e. Not scheduled f. Maximum of 10,000,000 intersections
30.	TREND SURFACE RESIDUAL	a. Not scheduled (these capabilities are available but have not been installed)
31.	UTILITIES	a. INSTALLED 1984
32.	ZOOM	a. AVAILABLE WITH THE GENERATE AND OVERLAY COMMANDS

33. DESIGN SCHEDULED FOR COMPLETION OCTOBER 1985

34. INSTALLED IN THE GENERATE COMMAND

35. Not scheduled

36. Some improvements have been made but much work needs to be completed

37. AVAILABLE ON VISUAL 500 TERMINALS

38. TENTATIVELY SCHEDULED 1987

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